TONER CONTAINER AND IMAGE FORMING APPARATUS USING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a copier, printer, facsimile apparatus or similar electrophotographic image forming apparatus and more particularly to a toner container to be removably mounted to an image forming apparatus for replenishing toner to a developing device.

Description of the Background Art

While a toner container mounted to an image forming apparatus is usually replaced by the user, the replacement often causes toner to scatter and is awkward to perform. A toner container easy to mount and dismount without causing toner to scatter has been proposed in various forms in the past. For example, a toner container whose cap is automatically opened when the container is moved and is therefore easy to use is available. However, this kind of toner container has sophisticated, expensive structure.

There has been proposed an image forming apparatus

and a toner container constructed to solve the above problem. The toner container has its toner outlet automatically opened when simply inserted into the setting portion of the apparatus from the above or has it automatically closed when simply pulled out of the setting portion. A nozzle extends upward from the setting portion. The toner container includes a self-closing valve that opens when the nozzle is inserted into the toner container. The self-closing valve is implemented as a sponge seal formed of compressed foam sponge non-permeable to air and formed with a cruciform slit. The sponge seal elastically deforms when the nozzle is inserted into the slit of the seal or closes the slit when the nozzle is removed from the slit, thereby preventing toner from leaking.

However, the problem with the sponge seal is that the elastic restoring force is apt to decrease due to, e.g., creep when the seal hardens in a low-temperature environment or due to aging. The sponge seal reduced in restoring force often causes the toner to leak when the toner is pulled out of the setting portion. Particularly, the toner outlet is positioned at the bottom of the toner container. Therefore, when the closing movement of the sponge seal is delayed at the time of mounting or dismounting of the toner container, the toner scatters around the setting portion due to its own weight. Moreover,

the nozzle is apt to tear off or shave off the sponge seal at the time of mounting and dismounting. The resulting pieces of the sponge seal would degrade image quality if introduced in the developing device.

It has been proposed to dispose a mechanical shutter, which closes under the action of a spring, in the toner container. The mechanical shutter, however, reduces the substantial area of the portion of the toner container that leads to the toner outlet, causing the toner to bridge. Particularly, it is likely that a flexible toner bag forming part of the toner container is folded or inclined, aggravating the bridging of the toner.

Technologies relating to the present invention are disclosed in, e.g., Japanese Patent Laid-Open Publication No. 7-20702, 9-197818 and 2000-267415.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a toner container or similar powder container extremely simple in structure and easy to handle while surely preventing toner from leaking, and an image forming apparatus using the same.

It is another object of the present invention to provide a toner container or similar powder container causing a minimum of toner to remain therein due to bridging

despite the use of a mechanical shutter, and an image forming apparatus using the same.

A toner container of the present invention stores powdery toner to be replenished via a toner outlet thereof and includes a container body. A shutter device is positioned in the toner outlet for selectively opening or closing the toner outlet. The shutter device includes an opening/closing member, a resilient member constantly biasing the opening/closing member from the inside toward the outside of the container body, and a support member supporting the resilient member and opening/closing member.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings in which:

FIG. 1 is a view showing an image forming apparatus using a toner container embodying the present invention;

FIG. 2 is a section showing a toner replenishing device included in the image forming apparatus;

FIG. 3 is an enlarged section showing a container holder or setting portion included in the toner replenishing device;

FIG. 4 is an exploded isometric view showing shutter means included in the illustrative embodiment;

FIG. 5 is a section showing the toner container removed from the container holder;

FIG. 6 is an enlarged section showing the shutter means;

FIG. 7 is a section showing how the toner container is removed from the container holder;

FIG. 8 is an external isometric view of the toner container with the shutter means, as seen from obliquely below;

FIG. 9 is a section showing a toner container apt to cause toner to stay therein;

FIG. 10 is an external isometric view of a toner container with a bent member adhered thereto;

FIGS. 11A and 11B are respectively a front view and a plan view showing the bent member;

FIG. 12 is an external isometric view showing a modification of the illustrative embodiment;

FIG. 13 is an external isometric view showing another modification of the illustrative embodiment; and

FIG. 14 is an external isometric view showing a specific arrangement of four toner containers in the container holder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, an image forming apparatus embodying the present invention is shown and implemented as a color laser printer by way of example. As shown, the printer includes a printer body 1. A sheet feeding section and an image forming section 3 are respectively arranged in the upper portion and lower portion of the printer body 1. The image forming section 3 includes an image transfer belt device generally inclined downward toward the sheet feeding section 2. The image transfer belt device includes a plurality of (four in the illustrative embodiment) rollers 11 and an endless, image transfer belt 12 passed over the rollers 11. A drive source, not shown, is drivably connected to one of the rollers 11 for driving the belt 12 counterclockwise, as indicated by an arrow in FIG. 1.

A magenta (M), a cyan (c), a yellow (Y) and a black (Bk) image forming unit 4M, 4C, 4Y and 4Bk, respectively, are sequentially arranged in this order, as named from the bottom to the top. The image forming units 3M through 4Bk are arranged side by side above the upper run of the image transfer belt (simply belt hereinafter) 12. The image forming units 4M through 4Bk each include a photoconductive drum or image carrier 5 rotatable clockwise, as viewed in FIG. 1, by being driven by drive

means not shown. Arranged around the drum 1 are a charge roller or charging means 6, an optical writing unit 8, a developing device or developing means 10, and a cleaning device or cleaning means 9. The developing device 10 stores a toner and carrier mixture or two-ingredient type developer. A toner replenishing device, which will be described later, replenishes fresh toner to the developing device 10, as needed.

The operation of the color printer in a full-color mode will be described hereinafter. First, in the magenta image forming unit 4M, for example, the charge roller 6 uniformly charges the surface of the drum 5. In the optical writing unit 8, a laser diode, not shown, is driven in accordance with M image data to emit a laser beam toward a polygonal mirror 8a. The laser beam steered by the polygonal mirror 8a is incident to the charged surface of the drum 5 via, e.g., a cylindrical lens and scans the surface of the drum 5, thereby writing a latent image. The developing device 10 develops the latent image with magenta toner to thereby form a magenta toner image. It is to be noted that the above image data may be input from personal computer or similar host machine to the printer.

A sheet or recording medium is fed from the sheet feeding section 2 to a registration roller pair 13, which is positioned upstream of the belt 12 in the direction of

sheet conveyance. The registration roller pair 13 once stops the sheet and then conveys it to the belt 12 in synchronism with the rotation of the drum 5. The belt 12 conveys the sheet to an image transfer position where the belt 12 faces the drum 5. An image transfer roller 14, which contacts the inner surface of the belt 12, transfers the magenta toner image from the drum 5 to the sheet.

The other image forming units 4C, 4Y and 4Bk form respective toner images on their drums 5 in the same manner as the image forming unit 4M. Such toner images are sequentially transferred to the belt 12 one above the other. The printer therefore forms a full-color image on the sheet as rapidly as a monochromatic printer, which forms a monochromatic image. This is an advantage particular to a tandem image forming apparatus.

The sheet with the full-color image is separated from the belt 12 and then conveyed to a fixing device 15. The fixing device 15 fixes the full-color image formed on the sheet. The sheet or print coming out of the fixing device 15 is directly driven out of the printer body 1 or is reversed and then driven out to a print tray 16 face down, which is mounted on the top of the printer body 1. Today, the function of discharging prints face down is essential with a printer for stacking sheets in order of page.

The illustrative embodiment monitors the toner

content of the developer stored in the developing device 10 and replenishes fresh toner when the toner content decreases. Specifically, a toner container or toner storing means 20 is located at a position remote from the developing device 10, i.e., in the top right portion of the printer body 1 in the illustrative embodiment. A toner replenishing device replenishes fresh toner from the toner container 20 to the developing device 10.

FIG. 2 shows a specific configuration of the toner replenishing device. As shown, a suction type powder pump 40 adjoins or is constructed integrally with the developing device 10 and plays the role of sucking means. The powder pump 40, which is a single axis, eccentric screw pump, is generally made up of a screw-like rotor 41, a stator 42, and a holder 43. The rotor 41 is implemented as an eccentric screw formed of metal or similar rigid material. The stator 42 is formed of rubber or similar elastic material. The holder 43 is formed of, e.g., resin and holds the stator 52 in such a manner as to prevent it from rotating. The holder 43 forms a powder conveyance passage. The rotor 41 is connected to a drive shaft 41a by pin joint that absorbs the eccentric movement of the rotor 41. A gear 45 is affixed to the drive shaft 45 and selectively driven via a clutch 45.

The holder 43 has a toner inlet at its right end,

as viewed in FIG. 2. A nozzle 51, which will be described specifically later, includes a connection port 54. A tube 17 provides fluid communication between the toner inlet of the holder 43 and the connection port 54 of the nozzle 51. The tube 17 should preferably be formed of, polyurethane rubber, nitrile rubber, silicone rubber or similar rubber highly resistant to toner. Such a flexible tube 17 can be easily arranged in any desired direction.

As shown in FIGS. 2 and 3, the toner container 20 is removably positioned on a container holder or setting portion 50. The nozzle 51 having a circular cross-section extends from the container holder 50 upward. When the toner container 20 is inserted into the container holder 50 downward, the nozzle 51 penetrates into the toner container 20. The upper portion of the nozzle 51 terminates at a conical or spherical tip 52 formed integrally with or affixed to the nozzle 51. The nozzle 51 has a tubular structure having a single wall and forming an air/toner passage 53. An air inlet port 55 is formed in the nozzle 51 above the connection port 54.

A pipe 47 connects an air pump or air feeding means 46 to the air inlet port 55 of the nozzle 51. The air pump 46 implements a flow rate of about 1 litter to 3 litters for a minute. The air pump 46 in operation sends air into the toner container 20 via the pipe 47 and air/toner passage

53. Air sent into the toner container 20 dashes through the toner layer present in the toner container 20, fluidizing the toner by agitating it. As a result, the toner whose fluidity is originally low becomes as fluid as liquid. A check value, not shown, may be positioned in the pipe 47 for preventing the toner from entering the air pump 46.

As shown in FIG. 3, the toner container 20 has a bag-in-box structure made up of a box or protection case 21 and a deformable, hermetic toner bag or container body 33 received in the box 21. The box 21 is formed of paper, corrugated paper, resin or similar rigid material and has a space great enough to accommodate the toner bag 22. The toner bag 22 has its major part implemented by a polyester sheet, polyethylene film or similar flexible sheet in the form of a single layer or a plurality of layers. The flexible sheet is about 80 μm to 200 μm thick and folded in the same manner as in the art of paper folding. The major part of the toner bag 22 is tapered from a suitable intermediate portion thereof toward a toner outlet downward, so that the toner can be easily discharged.

A mouth member 23 is fitted in the toner outlet positioned at the bottom center of the tapered toner bag 22. The mouth member 23 is formed of polyethylene resin, nylon resin or similar resin. The mouth member 23 includes

a first or larger diameter portion 24 to which the toner bag 22 is adhered or welded, a second or smaller diameter portion 25 to which shutter means 30, which will be described later, is adhered or otherwise affixed, and a flat third portion 26 removably connecting the toner bag 22 to the box 21. The third portion 26 is positioned between the first portion 24 and the second portion 25. A through hole 27 (see FIG. 6) extends throughout the mouth member 23. As shown in FIG. 6, The through hole 27 has a two-step structure that is larger in diameter at the second portion 24 side than at the first portion 25 side.

As shown in FIGS. 3 and 4, the shutter means 30 includes a support member 31 formed with a two-step through hole like the mouth member 23 and adhered or otherwise affixed to the mouth member 23. A piston member or opening/closing member 32 is movable in the through hole of the support member 31. The piston 32 is made up of a piston 32a and a piston rod 32b formed integrally with the piston 32a. A stop claw 33 is formed at the end of the piston rod 32b remote from the piston 32a. Beam members 28 extend upward from a smaller diameter portion 31b, which is included in the support member 31 and forms part of the two-step through hole. A ring portion 29 connects the beam members 28 to each other. The stop claw 33 and ring portion 29 are engaged with each other, constituting stop means.

Further, a compression coil spring or resilient member 34 surrounds, but is spaced from, the piston rod 32. The coil spring 34 is seated on the piston member 32 and ring portion 29 at opposite ends thereof, constantly biasing the piston member 32 downward. More specifically, the coil spring 34 constantly biases the piston member 32 downward against the nozzle 51, as viewed in FIG. 3. However, as shown in FIG. 5, when the nozzle 51 is pulled out of the mouth member 23, the piston member 32 is held in the position where the stop claw 33 is retained by the ring member 29. A seal member 35 is fitted in a larger diameter portion 31a, which formed the other part of the two-step hole of the support member 31. The seal member 35 is formed of foam sponge, rubber or similar elastic material and formed with a through hole 36 at its center.

FIG. 3 shows the piston member 32 in an opening position where it opens the toner outlet by being pushed upward by the nozzle 51 against the action of the coil spring 34. FIG. 5 shows the piston member 32 in a closing position where it closes the toner outlet. In the closing position, the circumference of the piston 32a is held in slidable contact with the seal member 35.

As shown in FIG. 6, assume that the piston 32a and the hole 36 of the seal member 35 have diameters of D1 and D2, respectively. Then, in the illustrative embodiment,

the diameter D1 is selected to be greater than the diameter D2. This allows the piston 32a to contact the seal member 35 over its entire circumference in the closing position of the piston member 32. The nozzle 51 is provided with the same diameter and shape D1 as the piston 32a. Further, assume that the inside diameter of the smaller diameter portion 31b of the support member 31 and the circumference of the piston 32a are spaced by a gap *s*. Then, in the illustrative embodiment, the gap *s* is selected to be 0.2 mm or above in order to prevent the above portion 31b from obstructing the movement of the piston member 32.

In the above configuration, the shutter means 30 biased by the coil spring 34 surely closes the toner outlet of the toner container 20 when the toner container 20 is removed from the nozzle 51 without regard to low temperature or similar environmental condition. In the closing position, although the piston member 32 slidingly contacts the seal member 35, the hole 36 of the seal member 35 prevents the seal member 35 from being partly torn off despite that the seal member 35 is formed of, e.g., sponge. Further, although the piston 32a remains in the bottom portion of the toner container 20 in the closing position, it slides deep into the container 20 away from the closing position when the nozzle 51 is fully inserted into the container 20. In this manner, in the illustrative

embodiment, the distance between the closing position and the opening position of the piston member 32 is great enough to prevent the piston member 32 from obstructing the discharge of the toner when held in the opening position.

The piston 32a of the piston member 32a has a bottom 32c facing the tip 52 of the nozzle 51. The bottom 32c and tip 52 are so configured as to closely contact each other without any gap. For example, the bottom 32c and tip 52 both may be implemented at flat faces. In the illustrative embodiment, the tip 52 is implemented as a spherical, convex surface while the bottom 32c is implemented as a concave surface complementary to the convex surface, i.e., identical in diameter as the convex surface. This allows the bottom 32c and tip 52 to surely align with each other even when the nozzle 51 being inserted into the toner container 20 is slightly shifted from the piston member 32.

The piston member 32 and nozzle 51 aligning with and closely contacting each other, as stated above, prevent the toner from leaking via the toner outlet when the toner container 20 is pulled away from the nozzle 51. More specifically, as shown in FIG. 7, when the toner container 20 is pulled away from the nozzle 51, the nozzle 51 contacting the seal member 35 together with the piston member 32 moves away from the piston member 32. At this

instant, if the piston member 32 and nozzle 51 are not axially aligned, then a gap temporarily appears between the piston member 32 and the seal member 35 and causes the toner to leak. Moreover, the bottom 32c of the piston member 32 and the tip 52 of the nozzle 51 closely contacting each other prevent the toner from dropping toward the toner outlet.

As shown in FIG. 6, the mouth member 23 and support member 31 are adhered together to constitute a single member. The smaller diameter portion 24 of the mouth member 23 and the smaller diameter portion 31b of the support member 31 both extend upward at the center. The smaller diameter portion 31b is positioned inside the smaller diameter portion 24, forming a double-wall structure. The toner bag 22 is adhered, welded or otherwise affixed to the smaller diameter portion 24.

The mouth member 23 and support member 31 may be implemented by a single member. However, the single member would make it difficult to fill the toner container 20 with the toner via the toner outlet because the shutter means 30 would be fitted on the mouth member 23 beforehand. The illustrative embodiment fills the toner container 20 with the toner before adhering the support member 31 to the mouth member 23 and then affixes the support member 31 supporting the shutter means 30. The toner can

therefore be smoothly introduced into the toner container 20 without being blocked by the shutter means 30.

Although the toner bag 22 filled with the toner is flexible, the box 21 accommodating the toner bag 22 protects it from shocks and impacts. In addition, the box 21 is easy to handle and store.

The shutter means 30, however, reduces the area of the toner outlet of the toner bag 22 and is apt to cause the toner to remain in the toner bag 22. This is because the toner bag 22 is tapered toward the hole 27 and because the shutter means 30 itself it positioned at the tapered portion. Further, it is likely that the tapered portion of the toner bag 22 is folded or bent due to the weight of the toner or a shock or an impact. Then, as shown in FIG. 8, the opposite walls of the toner bag 22 approach each other. Consequently, as shown in FIG. 9, the area of the toner outlet guiding the toner to the nozzle 51 decreases, causing the toner to stay without being discharged.

In light of the above, as shown in FIG. 10, the illustrative embodiment further includes a bent member 60 that prevents the toner from staying in the toner bag 22. The bent member 60 is formed of, e.g., Mylar (trade name) or similar elastic plastics. As shown in FIGS. 11A and 11B, the bent member 60 is an elongate thin member more

rigid than the toner bag 22 and bent at the center to form a peak 61. Two bent members 60 (only one is visible) are adhered to opposite side walls greater in area than the other side walls such that their peaks 61 protrude away from each other. The bent members 60 should preferably be positioned in the vicinity of or slightly above the ring portion 29 of the shutter means 30. The effect of the bent members 60 would be halved if they were positioned at an extremely high level or on the tapered portion. As shown in FIGS. 11A and 11B, the corners of each bent member 60 are rounded so as not to damage the toner bag 22.

The bent members 60 adhered to the toner bag 22 maintain the toner bag 22 in an outwardly expanded shape. Therefore, as shown in FIG. 3, the portion of the toner bag 22 that guides the toner toward the nozzle 51 in the vicinity of the shutter means 30 has a sufficient open area, preventing the toner from staying there. In addition, the bent members 60 prevent the toner bag 22 from bending in the vicinity of the shutter means 30 and thereby prevent the toner from bridging.

While the bent members 60 may be more rigid than the toner bag 22, as stated above, they should preferably be elastic so as to be easily adhered to the toner bag 22.

FIG. 12 shows a modification of the toner container 20. As shown, the toner bag 22 itself is formed with folds

62 in place of the bent members 60. The folds 62 are positioned at substantially the same level as the peaks 61 of the bent members 60 slightly above the shutter means 30. The toner container 20 with the folds 62 can prevent the toner from staying in the portion that guides the toner to the nozzle 51 without resorting to the bent members 60.

FIG. 13 shows another modification of the toner container 20. As shown, two magnets 63 (only one is visible) are adhered to opposite side walls of the toner bag 22 slightly above the shutter means 30. Metal pieces or magnetic pieces 64 are adhered to opposite side walls of the box 21 corresponding to the side walls of the toner bag 22. When the toner bag 22 is inserted into the box 21, the magnets 63 magnetically adhere to the metal pieces 64, broadening the portion of the toner bag 22 that guides the toner. This is also successful to prevent the toner from staying in the above portion of the toner bag 22. The magnets 63 and magnetic pieces 64 may be respectively fitted on the box 21 and toner bag 22, if desired. Also, the magnetic pieces 64 may also be implemented as magnets that attract the magnets 63.

In the toner replenishing device shown in FIG. 2, the rotor 41 in rotation generates high suction pressure in the powder pump 40, so that the toner is sucked out of the toner container 20. More specifically, the toner

drops to the vicinity of the nozzle 51 due to gravity and is conveyed to the outside of the toner container by the suction of the powder pump 40. However, the toner for the electrophotographic process has low fluidity and is therefore apt to bridge around the nozzle inside the toner container 20 after being sucked by the powder pump 40. The illustrative embodiment sends compressed air from the air pump 30 to the inside of the toner container 20 for thereby agitating and fluidizing the toner. Compressed air sent into the toner container 20 loosens even the bridged toner and thereby insures stable toner replenishment while reducing the toner to remain in the toner container 20.

The full-color image forming apparatus described above uses four toner containers 20 storing magenta toner, cyan toner, yellow toner and black toner, respectively. As shown in FIG. 14, such four toner containers 20 may advantageously be arranged side by side in the container holder 50. Of course, the toner containers 20 may adjoin each other in a square configuration. In any case, the toner containers 20 should preferably adjoin each other with some rule with their tops being flush with each other. This arrangement, however, makes it difficult for the operator to grip the individual toner container 20 when, e.g., it runs out of toner. While the space between nearby toner containers 20 may be increased to allow the operator

to grip one of them without touching the other toner containers 20, such a space is not practical because of a limited space available in the container holder 50.

In light of the above, as shown in FIG. 3, the illustrative embodiment additionally includes thrusting means 70 for pushing up the toner container 20 set in the container holder 50. The trusting means 70 includes a movable support frame 71 having a generally U-shaped section and formed with a flange 72 at its top edge. A spring or biasing member 73 constantly biases the support frame 71 upward. A seal 74 is received in the support frame 71 and formed of sponge or similar elastic material. The seal 74 is adhered or otherwise affixed to the support frame 71 and formed with a slit at its center. The slit allows the nozzle 51 to penetrate into the seal 74.

The spring 73 is a coil spring loaded between the wall of the container holder 50 and the support frame 71 and forces the flange 72 of the support frame 71 upward. When the toner container 20 is absent in the container holder 50, the spring 73 maintains the support frame 71 at the uppermost position shown in FIG. 3. The length and biasing force of the spring 73 are so selected as to prevent the support frame 71 held at the uppermost position from slipping out of the nozzle 51.

A stop 75 retains the toner container 20 correctly

set in the container holder 50. As shown in FIGS. 3 and 5, the stop 75 is formed integrally with the container holder 50. The container holder 50 is formed of plastics or sheet metal, so that the stop 75 has adequate resiliency. The stop 75 retains the top of the box 21 of the toner container 20, as illustrated. The box 21 is formed with a recess 21a that mates with the stop 75.

When the toner container 20 is correctly set in the container holder 50, it compresses the spring 73 while the stop 75 resiliently mates with the recess 21a of the box 21. The toner container 20 is therefore locked in the container holder 50. To pick up the toner container 20, the operator releases the stop 75 from the recess 21a. Then, the spring 73 thrusts the toner container 20 upward, as shown in FIG. 5. Therefore, even when four toner containers 20 are arranged side by side with a minimum of space therebetween, as shown in FIG. 14, the toner container 20 to be picked up is raised above the other toner containers 20 and can be easily picked up.

As for the biasing force of the spring 73, the toner container 20 is, in many cases, picked out of the apparatus for the purpose of replacement. It follows that the biasing force of the spring 73 should only be strong enough to push up the empty toner container 20. Further, the coil spring 34 of the shutter means 30 constantly biases the

toner container 20 upward like the spring 73. Assume that frictional resistance F acts on the seal valve 24 when the toner container 20 is pulled out of the nozzle 40, and that the empty toner container 20 has a weight of M. Then, the sum of the force of the spring 73 and that of the coil spring 34 should only be greater than the sum of F and M. Further, the biasing force of the spring 73 should only be smaller than the sum of F and the weight N of the full toner container 20.

While the illustrative embodiment and modifications thereof have concentrated on toner, the present invention is applicable to any kind of powder.

In summary, it will be seen that the present invention provides a toner container and an image forming apparatus using the same that have various unprecedented advantages, as enumerated below.

(1) Shutter means surely closes the toner outlet of the toner container without regard to low temperature or similar environmental condition, thereby preventing toner from leaking. The shutter means is simple, easy to assemble and reliable in operation.

(2) An opening/closing member included in a shutter member does not adjoin the end of the container body in an opening position. The opening/closing member therefore does not interfere with the discharge of the

toner, so that the toner can be smoothly replenished. The opening/closing member is usually closed to surely prevent the toner from leaking.

(3) A support member has a through hole made up of a larger diameter portion and a smaller diameter portion. A seal member is adhered to the wall of the larger diameter portion and can therefore be easily fitted on the support member. The seal member is elastic and formed with a through hole through which the opening/closing member can pass. The seal member is therefore preventing from tearing off when a nozzle is inserted, insuring stable toner replenishment.

(4) A gap of 0.2 mm or above exists between the outside diameter of the opening/closing member and the smaller diameter portion of the through hole. The gap insures smooth movement of the opening/closing member and smooth insertion of the nozzle.

(5) A compression spring or resilient member is wound round a piston rod between the piston portion and the ring portion of the opening/closing member. The spring is therefore easy to mount and exerts a biasing force in a preselected direction, promoting the stable closing movement of the shutter means. Further, the piston and the nozzle have the same size as seen in a section, preventing the toner from leaking when the nozzle is

inserted or pulled out.

(7) The nozzle has a convex tip and allows the piston to be easily aligned with the nozzle.

(8) The resilient member of the shutter means helps thrusting means push up the toner container when the toner container is to be removed. In addition, the thrusting means surely pushes up the toner container.

(9) Bent members can be easily fitted on a toner bag forming part of the toner container. The bent members surely prevent the toner from staying in the toner bag without damaging the toner bag. This is also true when the toner bag itself is processed instead of using the bent members.

(10) The toner container is easy to set on the image forming apparatus and causes a minimum of toner to leak.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof.